**Analysis of alternatives**

**Criteria:**

* Team members’ knowledge about the platform: are team members familiar with the chosen platform? Are team members comfortable with using this platform?
* Platform efficiency: is the platform efficient? The response time required for data transport?
* Platform stability: is the platform stable? Is there a big difference between best and worst response time?
* Platform research difficulty: how hard it is to solve problems through independent research?
* Bonus function: is there any unique functionality for the platform.

**Options:**

* Using “Johnny-five” library to interact with IoT and “Socket.io” for realtime bi-directional client server communication.
* Using “Johnny-five” library to interact with IoT and “Firebase” real-time database as a communication platform.

**Performance of each option:**

1. Using “Johnny-five” library to interact with IoT and “Socket.io” for realtime bi-directional client server communication.
   * Team members have no background of using this platform, but during the development of this project, members have used it and felt comfortable with using it.
   * Through some spike tests, this platform’s response time is around 2 - 5 milliseconds, having an average response time of 2.9 milliseconds, which is considered to be fast.
   * The best response time from spike tests is 2 milliseconds, and the worst response time is 5 milliseconds. The difference between is 3 milliseconds, which is considered to be stable.
   * In the last two phases of this project’s developments, the team have had problems using this platform, and they have all been solved by team members’ independent research, so the research difficulty is not too hard.
   * Socket.io is a library used to communicate serve and client, so it does not have any other functionalities than this.

2. Using “Johnny-five” library to interact with IoT and “Firebase” real-time database as a communication platform.

* + Team members have no background of using this platform, but during the development of this project, members have used it and felt comfortable with using it.
  + Through some spike tests, this platform’s response time is around 600 - 9000 milliseconds, having an average response time of 3444.5 milliseconds, which is slow.
  + The best response time from spike tests is 623 milliseconds, and the worst response time is 8665 milliseconds. The difference between is 8042 milliseconds, which is unstable.
  + In the last two phases of this project’s developments, the team have had problems using this platform, and they have all been solved by team members’ independent research, so the research difficulty is not too hard.
  + Using firebase as a platform is helpful when we need to record old data. As firebase is a database, it can store all data pushed to it. When the server or client is shut down and restarted, they can fetch old data any time they want. This bonus functionality is important when storing data is required.

**Recommend option:**

Based on the criteria stated in section one, choosing which one of the platform can not be decided by team members’ knowledge about the platform or platform research difficulty since they have similar outcome. Therefore, according to the spike tests conducted, we can compare the efficiency and stability of the two platforms. For efficiency, using [socket.io](http://socket.io/) is about 1000 times faster than using firebase, because [socket.io](http://socket.io/) directly communicates between server and client, where as using firebase always requires data to go through firebase so it slows down the response time by a lot. Same happens to stability, firebase base is far more unstable than [socket.io](http://socket.io/) as firebase relies on the internet too much. Therefore, the recommend option is option 1: Using “Johnny-five” library to interact with IoT and “Socket.io” for realtime bi-directional client server communication. As it wins at both efficiency and stability, it will have a much better performance.

(However, there are exceptions. As stated before, when the project needs to store data, firebase is the only option available, and in that case, firebase has to be used instead of socket.io. Therefore, firebase is still an option, but in the parts of the project that does not require storing data, socket.io is still the recommend option).